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Two setose anamorphic fungi: *Ampullicephala* gen. nov. and *Venustosynnema grandiae* sp. nov.

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Abstract — *Ampullicephala* gen. nov. is established to accommodate *Pleurotheciopsis setiformis*. *Venustosynnema grandiae* anam. sp. nov., found on a decaying stem of an unidentified dicotyledonous plant in "Serido", Rio Grande do Norte, Brazil, is described and illustrated. This fungus is characterized by a determinate, polysetose, synnematal conidiomata with a central acuminate, verrucose, dark red-brown seta encircled by numerous marginal verrucose, acerose, red-brown setae. Notes and illustrations on *V. ciliatum* are also given.

Key words — tropical rainforest, systematics, conidial fungi

Introduction

Re-examination of material of *Pleurotheciopsis setiformis* (Castañeda 1985) showed that it has blastic-synchronous conidium ontogeny developing in terminal, integrated, ampulliform conidiogenous cells. This pattern of ontogeny was classified as conidial development type 9 (holoblastic, apical wall-building simultaneously at several loci per conidiogenous cell and conidia becoming conidiogenous to form connected unbranched chains, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no conidiogenous cell proliferation) in Kirk et al. (2008). It is clearly different from *Pleurotheciopsis pusilla* B. Sutton (Sutton 1973), type species of the genus, which has blastic-sympodial proliferations and several broad, flat, sloping scars (loci) on the surface of the conidiogenous cells after conidial secession; this pattern of ontogeny was classified as conidial development type 10 (holoblastic, regularly alternating with sympodial proliferation, maturation by diffuse wall-building and secession schizolytic) in Kirk et al. (2008). These remarkable differences provide good reason to regard *P. setiformis* as different at the generic level from *P. pusilla*, and therefore the new genus *Ampullicephala* is proposed.

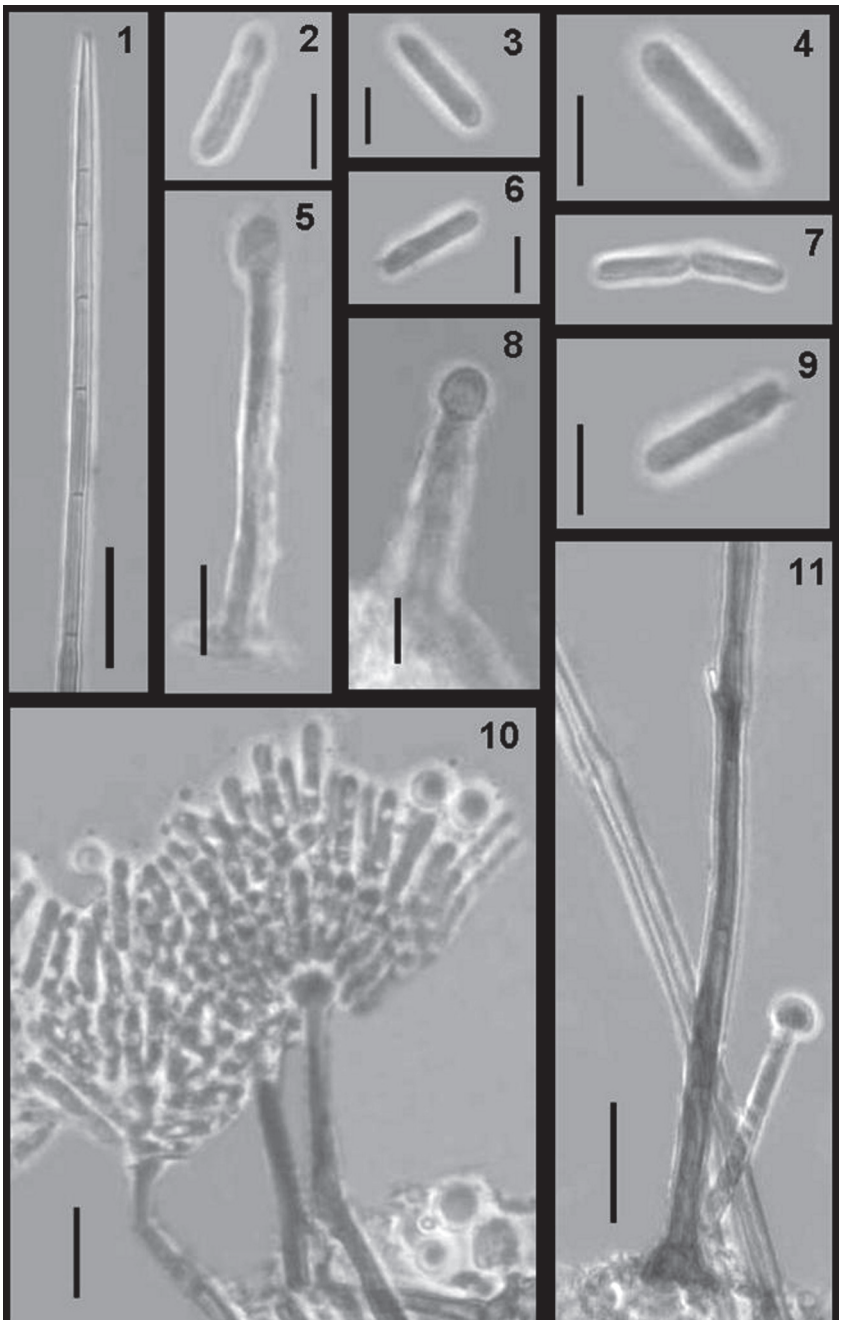
During an expedition in 2006 through the "Serido" caatinga vegetation, Rio Grande do Norte, Brazil, a conspicuous anamorphic fungus belonging to the genus *Venustosynnema* was collected. This appears to be conspecific with the fungus published as *V. ciliatum*, type species of the genus that Grandi & Gusmão (1996, 2002) examined from decaying roots of *Calathea zebrina* Lindl. and leaves of *Tibouchina pulchra* Cogn., but those authors mentioned the differences between the specimens examined and *V. ciliatum*. After comparing several specimens collected in Brazil with the type specimen of *V. ciliatum,* remarkable differences were found and therefore a new species for the Brazilian fungus is proposed.

Materials and methods

Samples of plant material were placed in separate paper bags and taken to the laboratory, then incubated in Petri dishes at 25º C in a moist chamber composed of plastic containers (50 L capacity) with 200 ml of sterile water plus 2 ml of glycerol, and examined at regular intervals for the presence of microfungi. Mounts were prepared in polyvinyl alcohol-glycerol (8.0 g in 100 ml of water, plus 5 ml of glycerol) and microscopic measurements made at a magnification of × 1000.

Figs. 1–11. *Ampullicephala setiformis*, photomicrographs from holotype (INIFAT C85/79). Fig. 1. Seta. Figs. 2–4, 6–7, 9. Conidia. Figs. 5, 8, 11. Conidiophores and conidiogenous cells. Fig. 10. Conidiophores and conidiogenous cells and conidia.

Scale is indicated by bars (Figs. 1, 11: 40 µm; Figs. 2-4, 6-7, 9: 3 µm; Figs. 5, 8: 20 µm)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Taxonomy

Ampullicephala R.F. Castañeda, Minter & M. Stadler, **anam. gen. nov.**

MycoBank, MB 512123

Fungus anamorphicus pertinens. Coloniae in substrato naturali pilosae usque ad caespitosa, effusae, albo-brunnea vel brunneae. Mycelium partim superficiale et partim in substrato. SETAE cylindricae, acerosae ad usque acuminatae, erectae, septatae, simplicissimae vel ramosae, levia vel verrucosae, brunneae ad usque nigrae, contiguae ad conidiophorae oriundae. Conidiophora macronematosa, mononematosa, septata, brunnea vel olivacea, latvia vel verrucosa. Cellulae conidiogenae polyblasticae, simultaneae, ampulliformes, terminales, determinatae cum minutis denticulis, non manifestis praeditae. Conidiorum secessio schizolytica. Conidia blastico-simultanea, catenulata, cilíndrica vel oblonga, hyalina, 0–1-septata ad usque pluriseptata, laevia vel verrucosa. Teleomorphosis ignota.

Type species: *Ampullicephala setiformis* (R.F. Castañeda) R.F. Castañeda, Minter & M. Stadler

Etymology: Latin, *ampullicephala*, referring to the head-shaped of the conidiogenous cells.

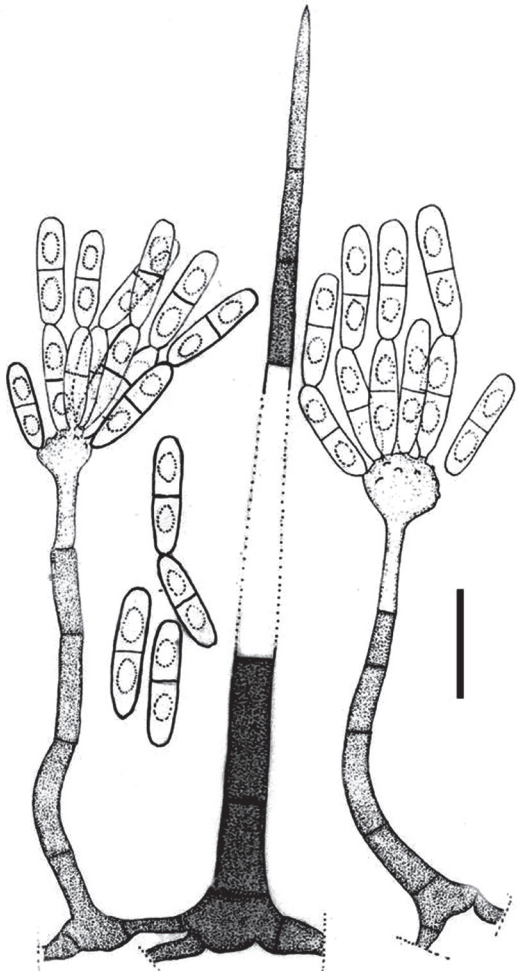
Anamorphic fungi. Colonies on the natural substrate hairy to velvety, spreading, brown or white-brown. Mycelium superficial and immersed. Setae cylindrical, acerose or acuminate, erect, septate, simple or branched, smooth or verrucose, brown to black, arising on the same hyphae near the conidiophores. Conidiophores macronematous, mononematous, septate, brown to olivaceous, smooth or verrucose. Conidiogenous cells polyblastic, synchronous, ampulliform, terminal, determinate, with small, inconspicuous denticles. Conidia blastic-synchronous, cylindrical or oblong, hyaline, 0–1-septate or pluriseptate, smooth or verrucose, produced in short acropetal chains. Teleomorph unknown.

Ampullicephala setiformis (R.F. Castañeda) R.F. Castañeda, Minter & M. Stadler, **comb. nov.**

MycoBank MB 512124 Figs. 1–12

Basionym: *Pleurotheciopsis setiformis* R.F. Castañeda, Deuteromycotina de Cuba. Hyphomycetes **III**: 28 (1985).

Colonies on the natural substrate hairy to caespitose, mostly epiphyllous, rarely amphigenous, white-brown. Mycelium superficial and immersed, composed of septate, branched, brown, 2.0–3.5 µm diam. hyphae. Setae cylindrical, acerose, 4–12-septate, erect, straight, simple, smooth, brown below, pale brown towards the apex, 100–220 × 5–7 µm, near conidiophores arising from the same hyphae. Conidiophores macronematous, mononematous, capitate, 1–5-septate, erect, straight, simple, smooth, up to 110 µm tall and 3.5–6.0 µm wide at the base. Conidiogenous cells ampulliform, blastic-synchronous, terminal, determinate, 4–12 × 4–6 µm, very pale brown to



Figs.12. *Ampullicephala setiformis*, drawings from holotype (INIFAT C85/79). Seta, conidiophores, conidiogenous cells and conidia. Scale is indicated by bar (10 μm).

subhyaline, with 6–12 inconspicuous denticles. Conidia cylindrical to oblong, slightly truncated at the ends, 1-septate, guttulate, hyaline, 7–8(–12) × 4–6 μm, formed in short acropetal white chains. Conidia usually remain connected after they are released.

Specimen examined: INIFAT C85/79 (holotype). **CUBA, Pinar del Rio**: Soroa, on decaying leaves of *Bauhinia cumanensis* Kunth, 22º 47' N and 83º 00' W, 240 m alt, 12.IV.1982, coll. R.F. Castañeda Ruiz.

Comments: Da Cruz et al. (2007) provided a description and illustration of *Ampullicephala setiformis* (as *Pleurotheciopsis setiformis*) found on a decaying leaf of an unidentified plant in Brazil. In other genera of anamorphic fungi with synchronous conidial development, the proximal conidia are produced simultaneously on ampulliform conidiogenous cells; secondary and tertiary conidia do not develop at the same time as in *Gonatobotryum* Sacc. and *Gonatobotrys* Corda (Walker & Minter 1981). Somewhat similar conidial development can be observed in *Aureobasidium* Viala & G. Boyer, *Botryosporium* Corda, and *Botrytis* P. Micheli ex Pers., however no taxa have been reported with the combined characters of setae, conidiophores or hyphal conidiomata with synchronous conidium ontogeny, and hyaline, 0–1-septate, blastocatenulate conidia as are exhibited by *Ampullicephala*.

Venustosynnema grandiae Gusmão, V.O. Moraes & R.F. Castañeda, **anam. sp. nov.**
MycoBank MB 511073 Figs. 13–31

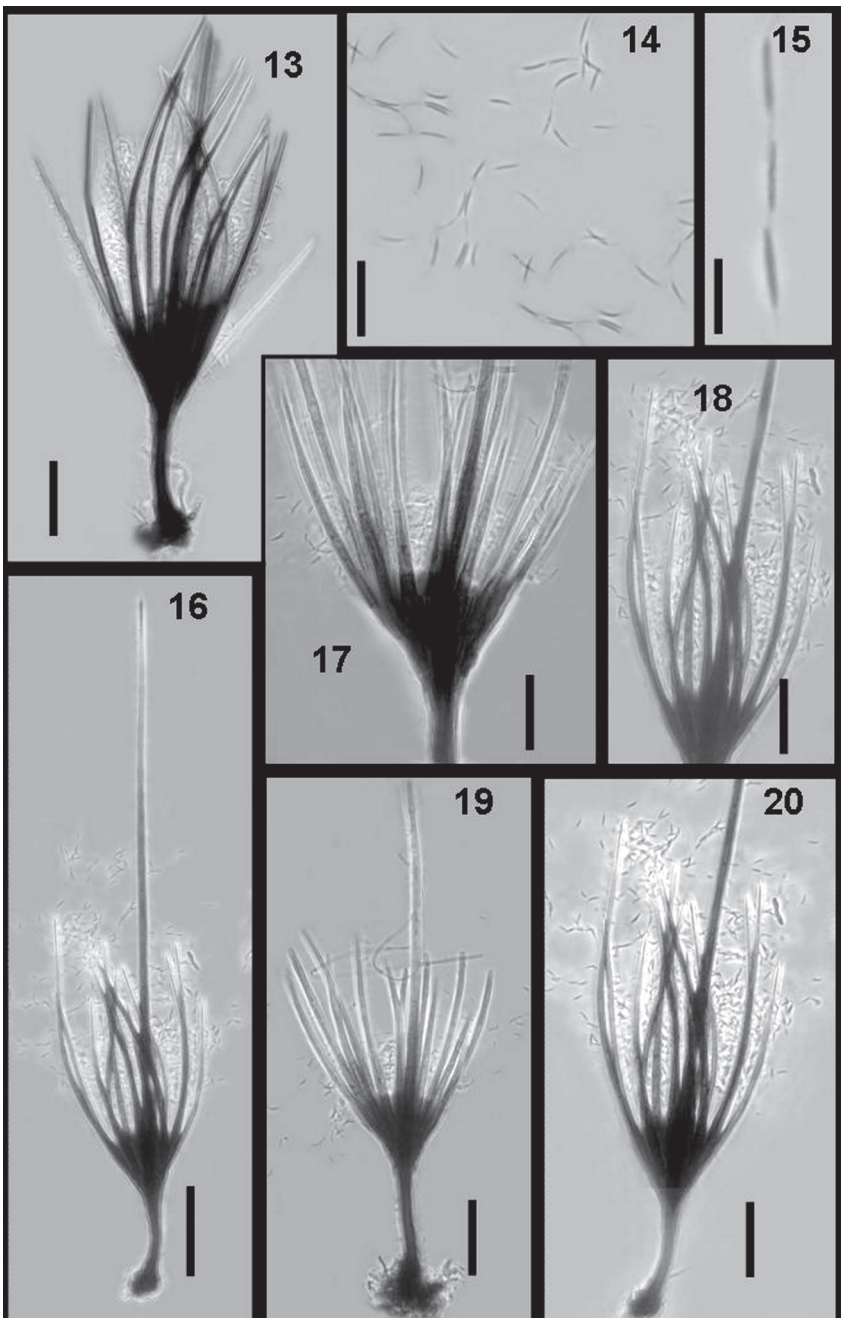
Ad Venustosynnemis ciliati *differt in conidiomatis synnematis atro rubro-brunneis, 350–450 × 17–25 µm (setis centralibus exclusis). Setis centralibus, acuminatis, ad usque 630 µm alti, 8–12 µm crassis, verrucosis, atrobrunneis, 20- ad 27-septatis et filamentis circundatis septatis, percompactis, dilute brunneis vel brunneis 2–3 µm, laevibus, sed deinde in setis marginalibus mutatis ad apicem. Setis marginalibus verrucosis interdum tuberculatis ad basim, acuminata, atrobruneis vel rubro-brunneis, 125–260 × 6.0–7.5 µm. Conidia alantoidea, hyalina, laevia, 6–8(–10) × 1.5–2.0 µm, utrimque setulosa, setula 4–6 µm longa in massa mucosa, alba congesta.*

Type: **BRAZIL**, **Rio de Grande do Norte**, "Serido", on decaying leaf of an unidentified dicotyledons plant. Coll. V.O. Moraes Junior, 24.V.2006, HUEFS120875 (**holotype**).

Etymology: Latin, *grandiae* named in honor of Dr. Rosely Ana Piccolo Grandi, a recognized mycologist from Brazil.

Colonies on the natural substratum effuse, black or dark brown. Conidiomata synnematous, scattered, erect, straight, 350–450 × 17–25 µm (central setae excluded), dark red-brown to dark, composed of pale brown to brown, parallel, compact, 2–3 µm diam., septate peripheral hyphae, widening at the fertile apex; inner hyphae narrow, brown below and subhyaline to very pale brown towards the apex, smooth-walled, unbranched or rarely branched, giving rise to conidiophores. Marginal setae acuminate, curved, verrucose, sometimes tuberculate, dark red-brown, 125–260 × 6.0–7.5(–10) µm, originating from peripheral hyphae near fertile apex of the conidiomata. Central setae cylindrical, acuminate, erect, straight, up to 630 µm tall, 8–12 µm wide, verrucose, sometimes tuberculate, but smooth near the apex, 20–27-septate,

Figs. 13–20. *Venustosynnema grandiae,* photomicrographs from holotype (HUEFS120875). Figs. 13, 16–20. Setose synnemata. Figs. 14–15. Conidia.
Scale is indicated by bars (Figs 13, 16-20: 60 µm; Fig. 14: 10 µm; Fig. 15: 5 µm).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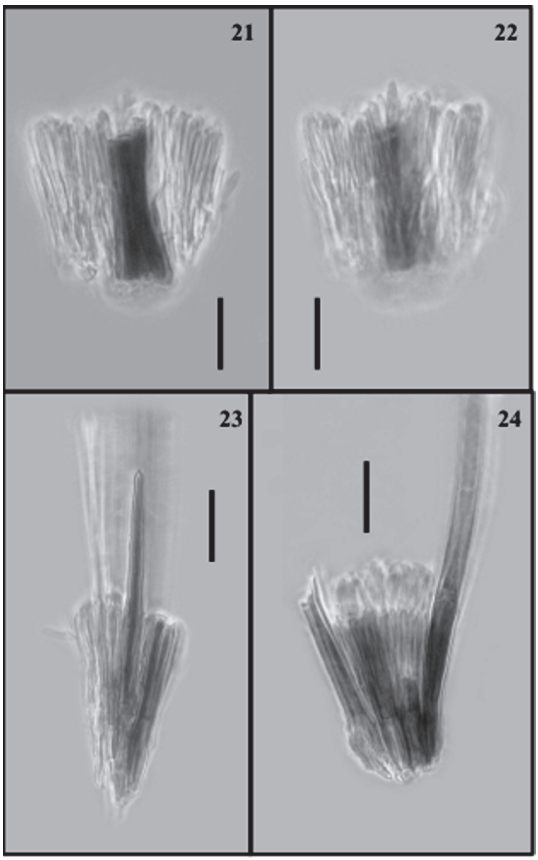
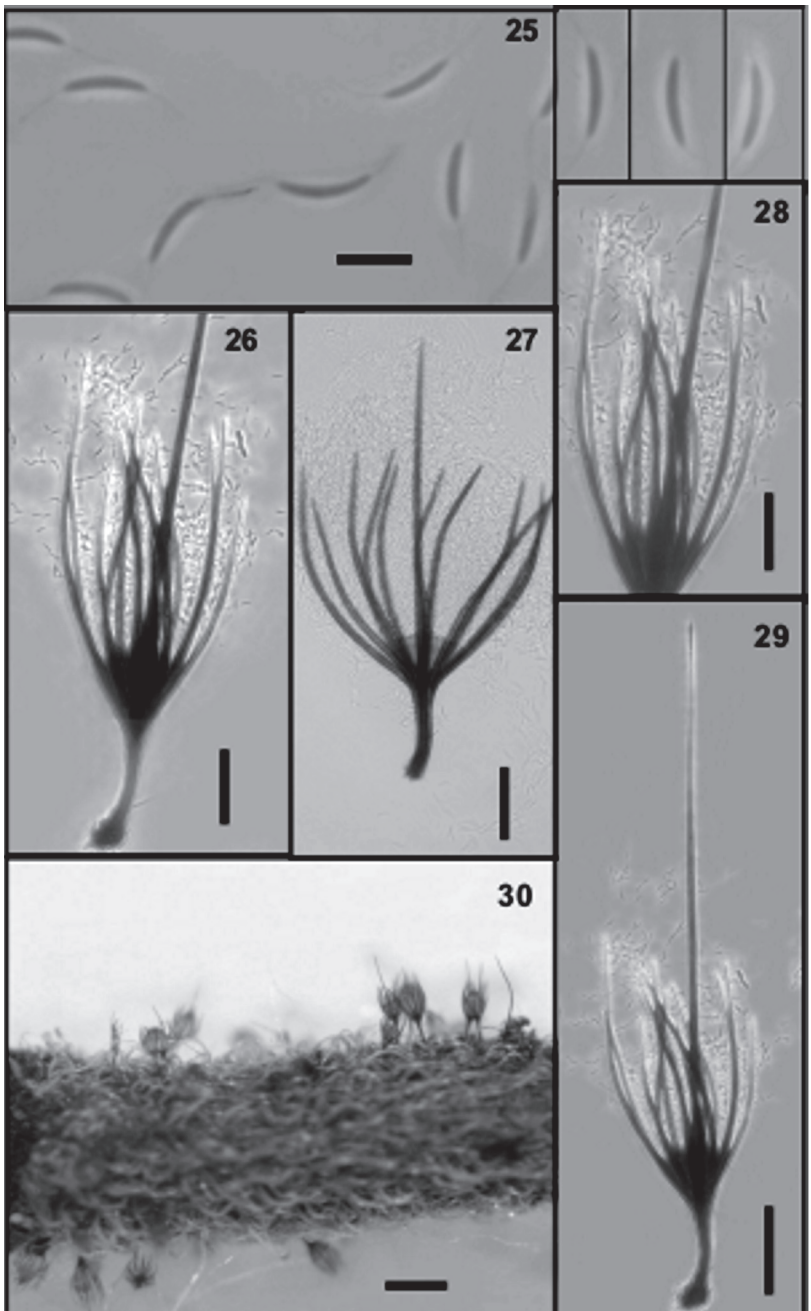


Figs. 21–24. *Venustosynnema grandiae,* photomicrographs from holotype (HUEFS120875). Conidiogenous cells. Scale is indicated by bars (5 μm).

dark red-brown to dark brown or black, arising from the base of conidiomata. Conidiophores differentiated, mononematous, arising from parallel internal hyphae, tightly aggregated, unbranched or rarely branched, erect, straight, cylindrical, septate, smooth-walled, 100–125 × 2–3.5 μm, brown at the base and very pale brown to subhyaline towards the apex, arising from internal hyphae. Conidiogenous cells blastic-phialidic, unilocal, cylindrical to slightly subulate, forming a very compact turf, subhyaline, smooth, 10–22.5 × 2–3.5 μm, encircled by peripheral setae. Conidia blastic-phialidic, allantoid to

Figs. 25–30 (right). *Venustosynnema grandiae,* photomicrographs from holotype (HUEFS120875). Fig. 25. Conidia. Figs. 26–29. Setose synnemata. Fig. 25. Conidiomata on the substratum. Scale is indicated by bars (Fig. 25: 10 μm; Figs. 26-29: 60 μm; Fig. 30: 100 μm).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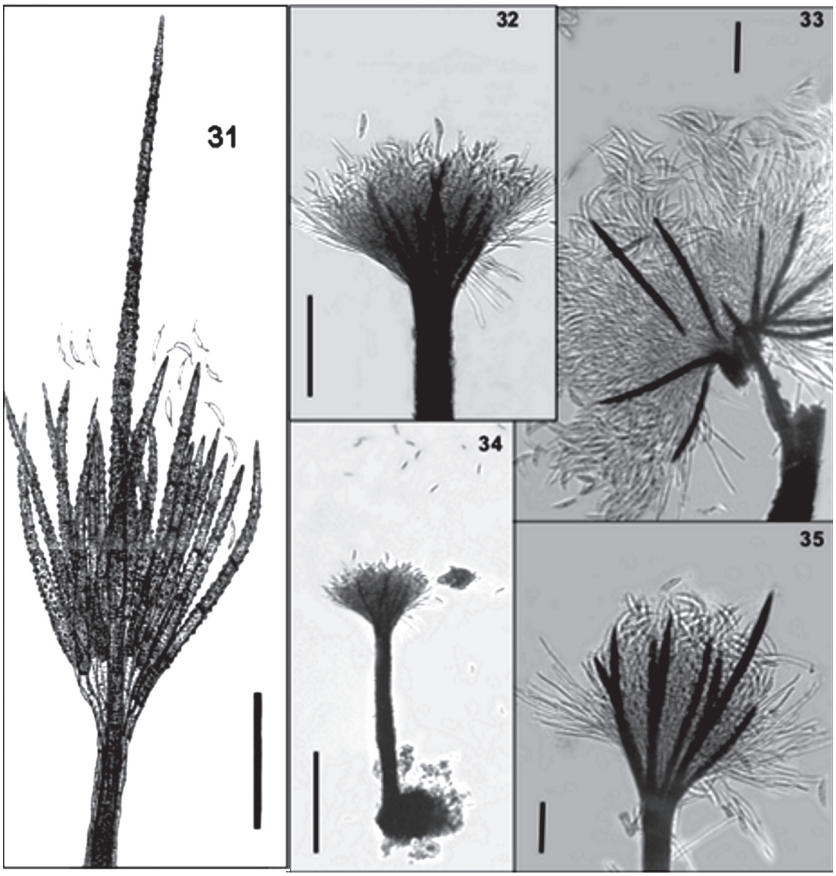


Fig. 31. *Venustosynnema grandiae,*, drawing from holotype (HUEFS120875). Setose synnema and conidia. Scale is indicated by bar (100 µm). Figs. 32–35. *Venustosynnema ciliatum,* photomicrographs from holotype (INIFAT C82/51). Setose synnemata, conidiogenous cells and conidia. Scale is indicated by bars (Fig 32: 100 µm; Figs. 33, 35: 60 µm; Fig 34: 200 µm).

sub-lunate, 1-celled, hyaline, 6–8(–10) × 1.5–2.0 µm, with setula 4–7 µm long at each end; accumulating in a white, mucous mass.

Other specimen examined: **BRAZIL**, **Bahia**, Municipio de Coribe, "Serra do Ramalho", on petiole of decaying leaf of an unidentified plant. Coll. S.M. Leão-Ferreira Junior, 17.II.2008, HUEFS131817.

Comments: *Venustosynnema* R.F. Castañeda & W.B. Kendr. (Castañeda & Kendrick 1990) was introduced to accommodate *Saccardaea ciliata* R.F. Castañeda et al. *Saccardaea* Cavara is a nom. dub. as was pointed out by Tulloch (1972), and Castañeda et al. (2002). Although the genus *Thozetella* Kuntze

shares some features with *Venustosynnema*, (phialidic conidiogenesis, aseptate, hyaline, curved conidia with an unbranched setula on each pole and synnematal conidiomata), the lack of microawns and the conspicuous marginal setae in *Venustosynnema* clearly differentiate both genera. Microawns are structures unique to *Thozetella* (Sutton & Cole 1983) and marginal or central setae have not been described from previously described species of *Thozetella* (Paulus et al. 2004, Allegrucci et al. 2004). Comparative analyses of *Venustosynnema* and *Thozetella* were made by Castañeda & Kendrick (1990) and Castañeda et al. (2002).

Other similar synnematous anamorphic fungi that can be compared with *Venustosynnema* are *Menisporopsis* S. Hughes and *Paramenisporopsis* Matsush. In *Menisporopsis,* a compact, pale brown to brown, synnematous group of conidiophores are disposed around a central or somewhat eccentric seta and the conidia are allantoid, lunate, falcate to cylindrical, hyaline, 0–1-septate, with one or several setula at each end or in diverse positions (Hughes 1968). In *Paramenisporopsis,* a compact or loosely arranged group of hyaline, synnematous conidiophores are mixed with several brown setae that arise parallel or radially with the conidiophores; the conidia are cylindrical to ellipsoid, 1-septate, pale brown, with one or two cellular appendages at each end, produced in a brown mucous mass (Matsushima 2001). In order to distinguish the features among these genera the follow key is provided.

Key to synnematous anamorphic fungi that produce conidia with appendages

1a. Conidiomata sporodochial or synnematal, brown, conidia hyaline, one-celled with a filiform appendage at each end, produced in white mucous masses, microawns sigmoid, uncinate, acerose or variable, always present, setae absent. . . . *Thozetella*

1b. Conidiomata usually synnematous, microawns absent, setae present 2

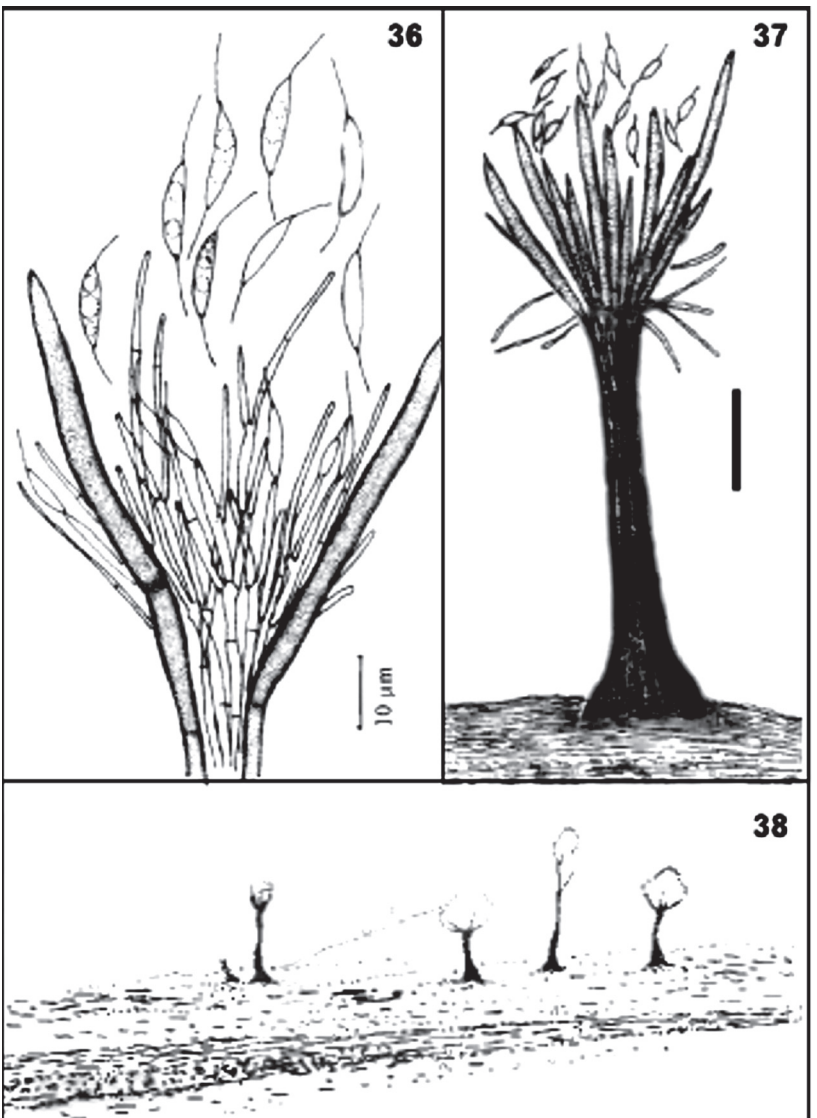
2a. Synnematous conidiophores hyaline, one or several brown setae arising mixed together with the conidiophores, conidia cylindrical to ellipsoid, pale brown, 1-septate with 1–2 cellular appendage at each end, produced in brown mucous masses . . . . . .*Paramenisporopsis*

2b. Synnematous conidiophores pale brown, brown or black compact around a central seta, conidia hyaline, 0–1 septate, with 1 or several filiform, extra-cellular appendages. 3

3a. Marginal setae arising from parallel synnematal hyphae absent . . . . . *Menisporopsis*

3b. Marginal setae arising from parallel peripheral hyphae always present . . . . . *Venustosynnema*

Venustosynnema grandiae can be easily differentiated from *V. ciliatum* by central setae that are present in the former species, and by the ornamentation, color and size of setae and conidia dimensions of both species.



Figs. 36–38. *Venustosynnema ciliatum,* drawings from holotype (INIFAT C82/51). Figs. 36–37. Setose synnemata, setae, marginal hyphae, conidiogenous cells and conidia. Fig. 38. Conidiomata on the substratum. Scale is indicated by bars (Fig 36: 10 µm; Fig. 37: 20 µm; Fig. 38: 1 mm).

Venustosynnema ciliatum (R.F. Castañeda, G.R.W. Arnold & A.G. Guerra) R.F. Castañeda & W.B. Kendr., University of Waterloo Biology Series 32: 45 (1990). Figs. 32–38

Colonies on natural substratum, effuse, black. Conidiomata synnematous, scattered, determinate, erect, straight or curved, unbranched setose towards the apex, black, 300–500 × 19–42 µm, becoming 85–200 µm wide at the apex. Marginal Setae cylindrical, acerose, septate, smooth, dark brown to black, 130–160 × 4–5 µm, originating from many of peripheral hyphae of the synnemata. Central Setae absent. Conidiophores macronematous, mononematous, simple or slightly branched, septate, subhyaline or hyaline above, brown below, arising from internal hyphae, giving rise to both conidiogenous cells and sterile apices. Conidiogenous cells blastic-phialidic, unilocal, cylindrical or subulate, discrete, determinate, colorless, 17–30 × 2–3 µm, smooth, with marked periclinal wall thickening, 0.5–1 µm deep. Conidia lunate or sub-lunate to allantoid, unicellular, smooth, guttulate, colorless, 13–16 × 2–4 µm, with setula 6–9 µm long at each end, seriate, forming white, mucous masses.

Specimen examined (holotype): **CUBA**, **Ciego de Avila**, on dead stem *Sorghum halepense* (L.) Pers., Coll. R.F. Castañeda, 26.IV.1982, INIFAT C82/51.

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Literature cited

Allegrucci N, Cazau MC, Cabello MN, Arambarri AM. 2004. *Thozetella buxifolia* sp. nov. – a new hyphomycetes from Argentina. Mycotaxon 90: 275–279.

Castañeda Ruíz RF. 1985. Deuteromycotina de Cuba. Hyphomycetes III. Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt", Havana, Cuba, 42 pp, 30 figs.

Castañeda Ruiz RF, Kendrick B. 1990. Conidial fungi from Cuba: I. Univ. Waterloo Biol. Ser. 32: 53 pp.

Castañeda Ruiz RF, Minter DW, Rodríguez Hernández M. 2002. *Venustosynnema ciliatum*. IMI Description of Fungi and Bacteria No. 1490.

Da Cruz ACR, Marques MFO, Gusmão LFP. 2007. Fungos anamórficos (Hyphomycetes) da chapada diamantina: novos registros para o estado da Bahia e Brasil. Rev. Brasileira Bot. 21: 847–855.

Grandi RAP, Gusmão LFP. 1996. Hyphomycetes descompositores de raízes de *Calathea zebrina* (Sims) Lindl. (*Marantaceae*), provenientes da reserva biológica do alto da Serra de Paranapiacaba, Santo André, SP, Brasil. Rev. Brasileira Bot. 19: 165–172.

Grandi RAP, Gusmão LFP. 2002. Hyphomycetes descompositores do folhedo de *Tibouchina pulchra* Cogn. Rev. Brasileira Bot. 25: 79–87.

Hughes S. 1968. New Zealand Fungi 12. *Menispora*, *Codinaea*, *Menisporopsis*. N. Z. J. Bot. 6: 323–375.

Kirk PM, Cannon PF, Minter DW, Stalpers JA. 2008. Dictionary of the Fungi 10th Edition, CAB International, Oxon, UK, 771 pp.

Matsushima T. 2001 Matsushima Mycological Memoirs 10. Matsushima Fungus Collection. Kobe, Japan. 214 pp.

Paulus B, Gadek P, Hyde KD. 2004. Phylogenetic and morphological assessment of five new species of *Thozetella* from an Australian rainforest. Mycologia 96: 1074–1087.

Sutton BC. 1973. Some hyphomycetes with holoblastic sympodial conidiogenous cells. Trans. Brit. Mycol. Soc. 61: 417–429.

Sutton BC, Cole GT. 1983. *Thozetella* (Hyphomycetes), an exercise in diversity. Trans. Brit. Mycol. Soc. 81: 97–107.

Tulloch M. 1972. The genus *Myrothecium*. Mycol. Pap. 130: 1–42.

Walker JC, Minter DW. 1981. Taxonomy of *Nematogonium*, *Gonatobotrys* and *Gonatorrhodiella*. Trans. Brit. Mycol. Soc.77: 489–500.